1950

Studies on Some North American Shrew Cestodes

Robert L. Rausch
University of Washington, rausch@u.washington.edu

STUDIES ON SOME NORTH AMERICAN SHREW CESTODES

ROBERT RAUSCH AND MERLE L. KUNS

U. S. Public Health Service, Anchorage, Alaska, and
Department of Biological Sciences, Purdue University, Lafayette, Indiana.

In spite of the importance of the various species of shrews to the biotic community, several aspects of their ecology remain very incompletely known. The helminths parasitic in the more conspicuous small mammals in North America have been studied more or less completely, but those occurring in shrews have been largely disregarded. This situation is particularly inappropriate when one considers that shrews often constitute the most abundant mammalian group in a given area. We have attempted to secure an adequate amount of shrew helminth material for study, and it is the purpose of this paper to present observations resulting from this work.

There have been, apparently, three species of cestodes recorded so far from North American shrews; these are *Hymenolepis anthocephalus* Van Gundy, 1935, *Diorchis reynoldsi* Jones, 1944, and *Protogynella blarinae* Jones, 1943. These parasites have been reported from the short-tailed shrew, *Blarina brevicauda* Say sspp. It seems that the parasites of the smaller shrews have been entirely neglected. This in part may be due to the difficulty with which good shrew material is obtained, since the animals undergo extremely rapid decomposition after death, often making cestodes useless for study. Taxonomic difficulties with the host animals themselves also may be considerable, particularly where several species occur in the same region.

For several years the senior author has collected helminths from shrews, but in some cases good material has been obtained only after repeated attempts. Most of the shrew material with which we are concerned was collected in the Central States. During the summer of 1948 the writers collected helminths from a number of shrews in the Jackson Hole region of Wyoming. Additional material has been obtained from the western provinces of Canada and from Alaska. Material was secured from the following species of shrews: *Blarina brevicauda, Sorex cinereus, S. vagrans, S. obscurus, S. articus,* and *Microsorex hoyi.* Subspecific names of the hosts are not considered here, except where mentioned in connection with a specific cestode. Most of the taxonomic work regarding the shrews, particularly the Alaskan forms, has been done by the senior author at the U. S. National Museum.

The cestodes which we have so far observed in shrews are considered separately. Of these, 4 species are described as new.

Protogynella blarinae Jones, 1943

(Figs. 1 and 2)

The genus *Protogynella* was erected by Jones (1943) for a very small cestode taken from *Blarina brevicauda* in Virginia. We collected this species from the same host in southern Wisconsin, although it was not found commonly there. While we are not able to either corroborate or refute certain of Jones' statements, it is evident that certain details were overlooked by him. *Protogynella blarinae* was described as having a "sac-like, unarmed" rostellum. Careful study of this cestode has revealed that the rostellum is actually armed with minute hooks. The number of hooks appears to be 46, and their length is about 4.0 μ (Figs. 1 and 2). This added knowledge regarding *P. blarinae* requires modification of the generic concept. Jones' failure to include

Received for publication, March 11, 1950.

a drawing of an entire mature segment causes some difficulty in understanding the morphology of this species; it is possible that certain other characters have been incorrectly interpreted, but conclusive evidence must be derived from the study of material in unusually favorable condition.

Diorchis reynoldsi Jones, 1944

The cestode was recorded by Jones (1944) from *Blarina brevicauda,* taken in Virginia. We have never observed this cestode in *Blarina,* nor in any other shrew species. It appears to have a restricted distribution.

Hymenolepis anthocephalus Van Gundy, 1935

Hymenolepis anthocephalus was commonly observed in *Blarina brevicauda* in the states of Ohio, Michigan, and Wisconsin. It is the largest cestode so far found in North American shrews. Apparently this species is restricted in occurrence to *Blarina,* since we have never taken it from shrews of other genera, even though they were collected from the immediate locality where infected specimens of *Blarina* were common.

Hymenolepis blarinae n. sp.

(Figs. 3 and 4)

Diagnosis: Strobila usually about 90 mm. long; greatest width, slightly over 1.0 mm. attained in gravid segments. Margins of strobila serrate; segments, 350 to 430 in number, usually wider than long, with fully gravid segments nearly square. Scolex about 250 μ in diameter; well developed and strongly set off from neck. Suckers about 125 by 190 μ. Rostellum not prominent; armed with 10 hooks, 33 μ in length. Ventral excretory canals up to 56 μ in diameter; dorsal canals, situated lateral to former, 5 μ in diameter. Genital pores unilateral, dextral; situated near the middle of segment. Cirrus sac from 110 to 130 μ long by about 16 μ wide. Cirrus spinose. Testes in mature segments about 50 μ in diameter; single anterior testis more or less between two posterior testes. Ovary elongate, with long axis transverse. Vagina posterior or ventral to cirrus sac. Vitelline gland posterior to ovary, near posterior margin of segment. Mature segments not observed posterior to first ¼ of length of strobila. Uterus first appears as transverse body in anterior part of segment; bilateral enlargements are formed, which enlarge until most of segment between excretory canals is filled by ovoid gravid uterus. Eggs apparently spherical, about 40 μ in diameter; distortion resulting from fixation has prevented accurate measurement. Larval hooks 19 μ long.

Host: Blarina b. brevicauda (Say).

Locality: Madison, Wisconsin.

Habitat: Small intestine.

Type: A slide bearing a complete specimen has been deposited in the Helminthological Collection of the U. S. National Museum, slide No. 47316.

Of other shrew cestodes belonging to the genus *Hymenolepis,* only one, *H. scutigera* (*Dujardin,* 1845), has 10 hooks which overlap in size those of the present species. These species, however, are readily differentiated on the basis of hook shape, in addition to other morphological characters.

Hymenolepis parva n. sp.

(Figs. 5 and 6)

Diagnosis: Strobila from 3 to 5 mm in length; greatest width, attained in gravid segments, about 300 μ. Margins of strobila not serrate. Segments from 125 to 150 in number. Scolex from 160 to 190 μ in diameter, markedly set off from neck. Suckers about 130 μ in diameter. Rostellum well developed; armed with 10 hooks 34 to 40 μ long. Ventral excretory canals about 8 μ in diameter. Genital pores unilateral, dextral; situated near middle of segment. Cirrus sac from 60 to 96 μ long by 12 to 22 μ wide. Cirrus spinose; about 25 μ long when protruded. External seminal vesicle present; in majority of cases it turns back ventrally upon cirrus sac, but may continue straight; in latter case gives appearance of cirrus sac extending across 2/3 of segment. Testes 25 to 35 μ in diameter in mature segments; situated in straight line. Ovary somewhat elongate, transverse, situated near middle of segment. Vitelline gland posterior and aporad to ovary, near posterior margin of segment. Vagina posterior to cirrus sac; seminal receptacle not prominent. Uterus first appears as transverse body which gradually enlarges to fill entire gravid segment. Eggs spherical, from 20 to 25 μ in diameter.

Host: Sorex c. cinereus Kerr. Also recorded from *S. cinereus streatori* Merriam (Anchorage, Alaska); *S. vagrans monticola* Merriam (Jackson Hole, Wyoming); *S. o. obscurus* Merriam (Tolugak Lake, arctic Alaska — lat. 68° 24′ N., long. 151° 26′ W.); *S. obscurus alascensis* Merriam (Juneau, Alaska).

Locality: Madison, Wisconsin.

Habitat: Small intestine.

Type: A slide bearing whole-mounts of paratype material has been deposited in the Helminthological Collection of the U. S. National Museum, slide No. 47317.

Hymenolepis parva appears to resemble most closely *H. scutigera* (Dujardin, 1845), the only other species of soricid *Hymenolepis* having 10 hooks of overlapping size. These two cestodes also have similar hook shapes. These species, however, may be differentiated on the basis of egg size and other morphological characters. Baylis (1934) found *H. toxometra* Baer, 1932, to be identical with *H. scutigera*. According to Baylis, uterus shape (an arc) and the greatly elongated gravid segments to differentiate *H. scutigera* from all other shrew species; this also applies to *H. parva*.

Hymenolepis schilleri n. sp.

(Figs. 7 and 8)

Diagnosis: Strobila length from 20 to 25 mm.; greatest width attained in terminal gravid segments, about 1.5 mm. Margins of strobila slightly serrate. Segments, about 300 in number, very much wider than long through strobila. Scolex strongly developed, from 410 to 420 μ in diameter. Suckers about 70 by 80 μ. Rostellum powerful; armed with 22 hooks 27 to 30 μ in length. Excretory canals markedly undulating; dorsal canal, about 8 μ in diameter, situated dorsal to proximal margin of ventral canal; latter 16 to 40 μ in diameter. Genital pores unilateral, dextral; situated in anterior third of margin of segment. Cirrus sac from 110 to 140 μ long by about 16 μ wide. Cirrus aspinose. Testes arranged in triangle near center of segment; two testes on same level, with third posterior to and between them. Ovary elongate, transverse; situated near anterior margin of segment. Vagina posterior to cirrus sac; large seminal receptacle may extend nearly to midline of segment. Vitelline gland transversely elongate; situated posterior to and parallel with ovary, near center of segment. Uterus first seen as transverse, rosette-like sac which gradually enlarges to fill entire gravid segment. Eggs from 21 to 24 μ in diameter.

Host: *Sorex c. cinereus* Kerr.

Locality: Madison, Wisconsin.

Habitat: Small intestine.

Type: A slide bearing paratype material has been deposited in the Helminthological collection of the U. S. National Museum, slide No. 47318.

Of other soricid cestodes of the genus *Hymenolepis*, *H. spinulosa* Cholodkowsky, 1912, *H. magnarostellata* Baer, 1931, *H. pistillum* (Dujardin, 1845), *H. maclaudi* Joyeux and Baer, 1928, *H. macroscelidarum* Baer, 1926, *H. furcata* (Stieda, 1862), and *H. uncinata* (Stieda, 1862) all have a hook number approximating that of *H. schilleri*. However, according to published descriptions, only *H. magnarostellata, H. maclaudi, H. pistillum,* and *H. furcata* actually overlap *H. schilleri* in hook number. Of these, only *H. magnarostellata* and *H. furcata* overlap in hook length. The latter two species as well as the others mentioned above are readily differentiated from the present species on the basis of hook shape, in addition to other morphological characters.

This cestode is named in honor of Mr. E. L. Schiller, who has been of aid in securing supporting material for this study.

Hymenolepis falculata n. sp.

(Figs. 9 and 10)

Diagnosis: Strobila from 30 to 40 mm. long; greatest width, attained in gravid segments, about 700 μ. Margins of strobila slightly serrate; segments, from 220 to 270 in number, slightly wider than long to nearly square. Scolex relatively small; from 180 to 220 μ in diameter; suckers about 50 by 75 μ. Rostellum well developed; armed with 12 hooks from 22 to 25 μ in length. Ventral excretory canals 32 to 64 μ in diameter; dorsal canals, situated directly dorsal to latter, about 8 μ in diameter. Genital pores unilateral, dextral; situated in anterior half of margin of segment. Cirrus sac elongate from 130 to 150 μ long by 16 to 24 μ in diameter. Cirrus spinose; about 70 μ long when protruded. Testes arranged in triangle; two situated antero-poral and one postero-aporal. Testes about 80 μ in diameter in mature segments. Ovary somewhat ovoid, with incised posterior margin; situated near middle of segment. Vagina posterior to cirrus sac; seminal receptacle not prominent. Ovoid vitelline gland situated in notch at posterior margin of ovary. Early uterus appears as wreath-like band completely surrounding female reproductive organs; open center of uterus persists until well toward end of strobila, when it disappears and the uterus fills entire gravid segment. Eggs ovoid; about 36 μ in length. Accurate measurement of eggs prevented by distortion resulting from fixation.

Host: *Sorex c. cinereus* Kerr.
Locality: Madison, Wisconsin.
Habitat: Small intestine.
Type: A slide bearing paratype material has been deposited in the Helminthological collection, U. S. National Museum, slide No. 47319.

Only two species of soricid cestodes of the genus *Hymenolepis* having 12 hooks have been described; these are *H. scalaris* (Dujardin, 1845) and *H. dodecantha* Baer, 1925. The hooks of both of these exceed those of *H. falculata* in length, and both differ in hook shape. The wreath-like shape of the early uterus of the latter serves to distinguish it readily from related species.

DISCUSSION

In addition to the 4 species described in the present paper, there are apparently 25 species of *Hymenolepis* which parasitize various shrews. Of these, only one, *H. anthocephalus* Van Gundy, 1935, has been described or recorded from North American hosts. It would seem, from present knowledge, that cestodes in North American shrews are strictly North American species, with none of the Eurasian forms represented insofar as the genus *Hymenolepis* is concerned. This is in contrast to certain other mammalian groups (*e.g.* microtine rodents) where Eurasian species occur more or less commonly, particularly in arctic-alpine regions. One of us (R. R.) has at present a large number of preserved shrews from the coast of the Bering Sea and Nunivak Island, the examination of which may divulge further information in this connection. Further studies on shrew helminths will be presented at a later date.

A key to the cestodes recorded from North American shrews has been prepared, based mainly on hook characters.

Key To Species Of Cestodes In North American Shrews

1. Scolex armed 3
   Scolex unarmed 2
2. Scolex relatively large and globular; no rostellum .... *H. anthocephalus* Van Gundy, 1935
3. Rostellar hooks more than 40 4
   Rostellar hooks less than 40 5
4. Strobila length about 1 mm; about 46 minute hooks present
   Protogynella blarinae Jones, 1944
   Strobila length 7 to 10 mm; about 100 minute hooks ..... *Diorchis reynoldsi* Jones, 1943
5. Rostellar hooks 22 in number; segments much wider than long ..... *H. schilleri* n. sp.
   Rostellar hooks 12 in number; pre-gravid uterus wreath-like in appearance
   H. falculata n. sp.
   Rostellar hooks 10 in number 6
6. Strobila from 7 to 10 mm. long; hook length 34 to 40 μ long ..... *H. parva* n. sp.
   Strobila about 90 μ long; hook length 33 μ ..... *H. blarinae* n. sp.

SUMMARY

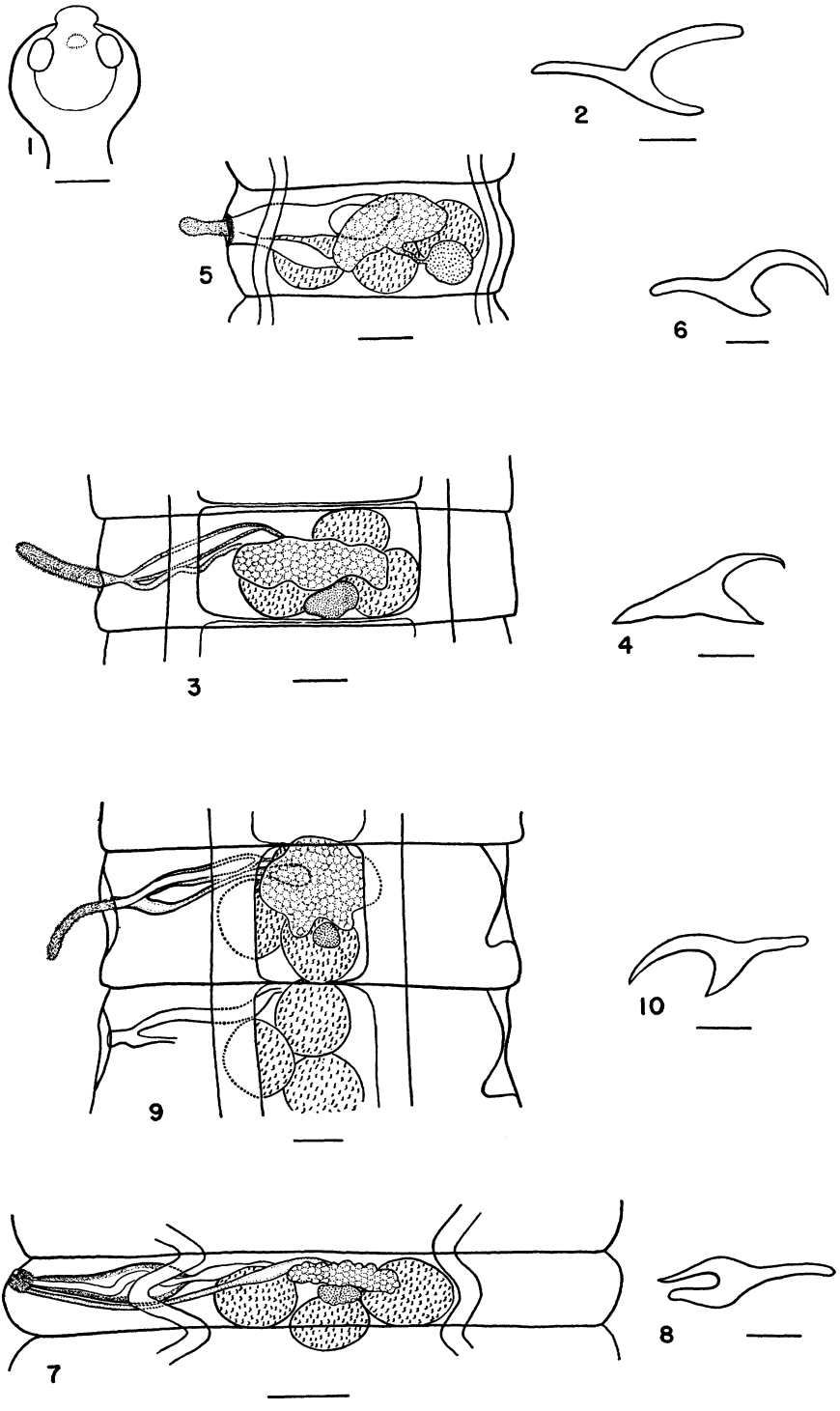
The cestodes of North American shrews are discussed, and 4 species, *Hymenolepis blarinae, H. parva, H. schilleri,* and *H. falculata,* are described as new. Rostellar hooks are reported for the first time from *Protogynella blarinae* Jones, 1944; this requires emendation of the generic diagnosis. Various host- and distribution records are also reported.

References

Baylis, H. A. 1934 Miscellaneous notes on parasitic worms. Annals and Mag. Nat. History Ser. 10, **13**: 223–228.

Jones, A. W. 1943 *Protogynella blarinae* n. g., n. sp., a new cestode from the shrew, *Blarina brevicauda* Say. Trans. Amer. Micr. Soc. **62**: 169–173.

PLATE I



——— 1944 *Diorchis reynoldsi* n. sp., a hymenolepidid cestode from the shrew. Trans. Amer. Micr. Soc. **63**: 46–49.

VAN GUNDY, C. O. 1935 *Hymenolepis anthocephalus,* a new tapeworm from the mole shrew, *Blarina brevicauda* Say. Trans. Amer. Micr. Soc. **54**: 240–244.

EXPLANATION OF PLATE

FIG. 1. Scolex of *Protogynella blarinae* showing hooks on retracted rostellum. Scale has a value of 100 μ.

FIG. 2. Rostellar hook of *P. blarinae.* Scale has a value of 1 μ.

FIG. 3. Mature segment of *Hymenolepis blarinae* n. sp. Scale has a value of 40 μ.

FIG. 4 Rostellar hook of *H. blarinae.* Scale has a value of 10 μ.

FIG. 5. Mature segment of *H. parva* n. sp. Scale has a value of 20 μ.

FIG. 6. Rostellar hook of *H. parva.* Scale has a value of 9 μ.

FIG. 7. Mature segment of *H. schilleri* n. sp. Scale has a value of 60 μ.

FIG. 8. Rostellar hook of *H. schilleri.* Scale has a value of 10 μ.

FIG. 9. Mature segment of *H. falculata* n. sp. Scale has a value of 80 μ.

FIG. 10. Rostellar hook of *H. falculata.* Scale has a value of 10 μ.